

Lesson 1.2 Notes

Early Networking:

ARPANET (Advanced Research Projects Agency Network) was a DOD-funded project. The first communication happened in 1969 from UCLA to Stanford. In 1983, TCP/IP became the standard protocol, forming the foundation of today's internet.

The World Wide Web (WWW) emerged in 1989 at CERN with Tim Berners-Lee and Robert Cailliau. They developed hypertext, the foundation of all modern websites, and opened it for public use.

Networking Basics:

Networking is the connection of two or more devices (computers, printers, storage, etc.) that share data. All devices must follow the same protocols to communicate successfully. Encapsulation is the process of wrapping data with headers at each network layer during transmission and then unwrapping them at the receiving end.

Standardization:

Standards are created through collaboration between international experts, governments, and private organizations. No single entity dictates protocols. Everyday examples include USB charging and cellphone power standards.

Key Standardization Organizations (SOs):

- **ISO (International Organization for Standards):** Based in Switzerland. Defines global standards across manufacturing, infrastructure, and communications, including the OSI model, website country codes, and security standards.
- **IEEE (Institute of Electrical and Electronics Engineers):** Defines protocols for physical media and access, including Ethernet, Wi-Fi, and MAC addresses (IEEE 802 standards).
- **IANA (Internet Assigned Numbers Authority):** Manages public IP addresses, top-level domains, and port numbers.
- **ICANN (Internet Corporation for Assigned Names and Numbers):** Oversees domain names and took over IANA stewardship in 2016.
- **IETF (Internet Engineering Task Force):** Develops and maintains open standards and protocols, most notably TCP/IP.

OSI Model (Created by ISO):

1. **Physical Layer:** Handles cables, wireless signals, and raw binary transmission. Devices include repeaters, hubs, and physical transmitters/receivers.

2. **Data Link Layer:** Works with MAC addresses, frames, and switch operations. Controls how devices share access on a LAN.
3. **Network Layer:** Uses IP addressing (IPv4/IPv6), creates packets, and determines routing paths. Routers operate here.
4. **Transport Layer:** Ensures reliability, flow control, packet sequencing, and multiplexing (ports and sockets). Uses segments/datagrams.
5. **Session Layer:** Manages authentication, authorization, checkpoints (resuming downloads), and synchronizing streams.
6. **Presentation Layer:** Handles data compression, conversion, and encryption/decryption for readability and security.
7. **Application Layer:** Interfaces with software applications. Not the app itself, but the protocols that let apps like Chrome and Safari both access web content in a standardized way.

TCP/IP Model:

The TCP/IP model simplifies the OSI into four layers:

- **Application** (OSI layers 5–7)
- **Transport** (OSI layer 4)
- **Internet** (OSI layer 3)
- **Network Access** (OSI layers 1–2)